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[U. S. Coast & Geodetic Survey]

Wm. Davis
STANDARD

1862.

MEAN RIGHT-ASCENSIONS

OF

CIRCUMPOLAR AND TIME STARS,

PREPARED FOR THE USE OF THE

U. S. COAST SURVEY.

[by B. A. Gould]

A. D. BACHE,
SUPERINTENDENT.

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WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1862.

STANDARD

MAN RIGHT-ASSERIONS

CIRCUMPOLAR AND TIME STARS

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1862WASHINGTON, *September* 13, 1862.

The accompanying determinations of star-places have been made by Dr. Gould for the use of the telegraph longitude parties of the United States Coast Survey, especially in determining time and instrumental corrections.

Their careful and thorough preparation, which is the fruit of many years' labor in the examination and employment of all existing observations available for the purpose, seems to entitle them to the name of "Standard Right-Ascensions," and these final results are now put in printed form, for a more convenient distribution among the parties of the survey and astronomers generally, than the manuscript form in which they have hitherto been circulated.

A. D. BACHE,
Superintendent U. S. Coast Survey.

CAMBRIDGE, September 10, 1862.

SIR: A list of *Mean Places of 48 Circumpolar Stars*—thirty-six of them being those used by STRUVE in his chronometric expedition between Altona and Greenwich, and four others being the “polar stars,” generally so called—was prepared for the use of the Coast Survey by me and the party under my charge in 1854, and first printed in the Superintendent’s *Annual Report for 1855*. A year later it was reprinted with corrections, and during the year 1857 was improved as far as possible with special reference to its employment at the Dudley Observatory, in Albany. The method of its formation was described in some detail in the sixth volume of the *Astronomical Journal*.

At the same time, and for the same purpose, a similar redetermination was made of the right-ascensions of 132 other fundamental stars, favorably situated for use with the circumpolars in determining time and azimuth. This has been known as the “Time-Star List,” and, although never printed in its completed form, has always been at the service of astronomers in this country.

The work of collecting new observations and including them in the investigation has been continued, and during the year ending July, 1861, entirely new determinations were made of the corrections needed for reducing the right-ascensions as given in the principal catalogues, and in the several annual volumes of observations at Greenwich, Edinburgh, and Oxford, to the equinoctial points of the catalogue which I had selected as the fundamental one, viz: ARGELANDER’S *DLX Stellarum Positiones Medie*.

During the summer of 1861 these new values were employed for yet another redetermination of the right ascensions and proper motions of 172 stars out of the 180; and all known observations and catalogue places since the time of BRADLEY, which seemed capable of adding to the accuracy of the results, were combined according to the method of least squares. No labor was spared which promised a return, not even the search for and reduction of crude observations scattered through the sundry volumes of unsystematic and disconnected observations at minor observatories.

The small corrections for reducing to the zero of ARGELANDER have been determined: 1st, by collation of all the right-ascensions common to his *Posit. Med.* and to the authority in question; and, 2d, when the number of stars common to both has proved inadequate, by a similar comparison with some catalogue for which the “reduction to ARGELANDER” is well determined. Examination has always been made for terms which are in any way functions of the declination or right-ascension, as well as for those which are constant.

To the mean places, proper motions, and precessional coefficients, have been added the constants for reducing from mean to apparent places, together with their annual variations. These variations do not hold strictly for 1855.0, but are the average values for the following decade, having been obtained by computing the logarithms for 1855 and 1865, and dividing their difference by ten. They have been computed also by the differential formulas, for 1855.0; but as these determinations excluded the proper motions and the change in the precessional constants, they have been used only as a control, and the former values retained as more convenient.

Throughout these computations the Pulkowa constants of precession and nutation have been employed.

The stars *Sirius*, *Castor*, *Procyon*, and 61^1 *Cygni*, originally numbered 35, 39, 40, 115, are so ill-suited for the determination of time, owing to their magnitude, variability of proper motion, or orbital revolution, that they are now omitted from the Time-Star List, though without changing the numerical notation.

All the important details and incidental results of these investigations are prepared in proper form for the forthcoming “Records and Results of the United States Coast Survey;” but since the resultant values have been for some time adopted as standards of right-ascension by the Washington Observatory and the American Nautical Almanac, as well as in the Coast Survey parties and office, and since constant applications—as well as various other reasons—render the increase of copies desirable, I respectfully suggest that the results be put in type in advance of the long-deferred publication of the volume.

The table of mean declinations for the circumpolar stars is from the *Astronomical Journal* No. 130, with a slight change in the arrangement.

Very respectfully, yours,

B. A. GOULD.

Prof. A. D. BACHE, Superintendent U. S. Coast Survey.

CIRCUMPOLAR LIST.—RIGHT-ASCENSIONS.

No.	NAME.	α		μ	A	100 B	100 C	$\log a$	$\log b$	$\log c$	$\log d$	No.
1	21 Cassiopeæ	0 36	9.16	-0.0114	+	3.8138	+	9.38330 + 12.84	8.58486 + 90.04	0.58136 + 18.04	9.36656 + 13.94	1
2	POLARIS	1 6	30.19	+0.0729	18.0464	6.0321	0.021167	0.39814 + 143.04	9.87325 + 353.84	1.25640 + 285.44	0.39800 + 145.14	2
3	4 Cassiopeæ	1 20	30.56	+0.0249	4.3035	0.0704	0.000015	9.25254 + 5.64	8.81662 + 47.54	0.63383 + 14.24	9.22418 + 7.04	3
4	50 Cassiopeæ	1 51	8.56	-0.0113	4.9583	0.0923	0.000019	9.27416 + 3.04	8.99591 + 40.94	0.69534 + 16.24	9.25166 + 4.24	4
5	1 Cassiopeæ	2 17	10.75	-0.0079	4.8251	0.0651	0.000008	9.14460 - 2.44	8.97839 + 30.44	0.68350 + 11.44	9.10781 - 0.94	5
6	48 Cephei	3 2	5.55	+0.0164	7.2695	0.1751	+0.000021	9.32375 - 10.64	9.33170 + 35.44	0.86150 + 20.94	9.31281 - 9.94	6
7	2 Camelopardalis	4 39	39.85	-0.0031	5.9042	0.0353	-0.000011	8.75192 - 48.24	9.18887 + 10.04	0.77116 + 5.24	9.71295 - 47.54	7
8	Groombridge 966	5 20	21.98	+0.0080	7.9661	+0.0410	0.000043	8.64486 - 144.04	9.40262 + 7.04	0.90124 + 4.44	8.62968 - 143.84	8
9	22 Camelopardalis	6 2	51.55	-0.0021	6.6217	-0.0015	0.000022	7.37323 + 416.24	9.27677 - 0.24	0.82097 - 0.24	7.34443 + 1416.24	9
10	51 Cephei	6 31	5.74	-0.1062	30.6746	0.7917	0.004121	9.27444 + 641.74	0.13921 - 27.24	1.48678 - 24.64	9.27394 + 641.74	10
11	Piazzi VII. 67	7 15	45.04	+0.0026	6.3247	0.0406	0.000015	7.77604 + 54.14	9.24059 - 10.54	0.80104 - 5.64	7.74547 + 53.64	11
12	3 Ursæ Majoris	7 58	19.41	+0.0056	6.0844	0.0591	-0.000007	8.96092 + 28.34	9.20685 - 16.24	0.78422 - 8.44	8.93076 + 27.54	12
13	2 Ursæ Majoris	8 57	34.30	-0.0025	5.4035	0.0670	+0.000003	7.08992 + 10.14	9.09912 - 24.04	0.73268 - 10.84	7.90562 + 9.04	13
14	1 Draconis	9 16	2.10	-0.0077	9.2816	0.0671	0.000135	9.55606 + 2.94	9.49512 - 53.54	0.79762 - 38.04	9.55177 + 2.14	14
15	24 Ursæ Majoris	9 21	34.69	-0.0147	5.4739	0.0859	0.000010	7.18638 + 5.04	9.10409 - 30.24	0.73830 - 13.74	7.16063 + 3.84	15
16	32 Ursæ Majoris	10 7	27.04	-0.0164	4.4768	0.0582	0.000009	9.15708 - 0.84	8.88527 - 34.84	0.65097 - 11.24	9.11723 - 2.44	16
17	9 Draconis	10 22	38.41	-0.0002	5.3597	0.1426	0.000046	7.41398 - 8.44	9.06943 - 53.54	0.72913 - 22.94	7.40174 - 9.24	17
18	2 Draconis	11 22	44.59	-0.0108	3.6706	0.0569	0.000016	9.28682 - 9.64	8.50167 - 82.74	0.56474 - 13.44	9.26917 - 11.24	18
19	4 Draconis	12 5	21.04	+0.0100	2.9194	0.0645	0.000032	7.52125 - 20.84	7.88977 + 353.54	0.46530 - 19.04	7.51232 - 21.64	19
20	2 Draconis	12 27	16.19	-0.0109	2.6215	-0.0279	+0.000009	7.29922 - 13.04	7.837677 + 56.84	0.41854 - 9.24	7.27389 - 14.44	20
21	32 Camelop. (fol.)	12 48	7.02	-0.0125	0.3279	+0.1160	-0.000108	7.80978 - 40.64	7.13836 - 35.44	9.51576 + 333.04	7.80756 - 41.14	21
22	2 Draconis	14 0	27.93	-0.0066	+1.6286	0.0024	0.000000	9.13611 - 10.84	8.89958 + 1.14	0.21181 + 1.34	9.09363 - 12.54	22
23	5 Ursæ Minoris	14 27	53.17	+0.0051	-0.2370	0.0615	0.000019	9.35323 - 13.34	7.22990 - 14.84	7.34077 - 14.34	9.34077 - 14.34	23
24	2 Ursæ Minoris	14 51	10.52	-0.0071	0.2595	0.0519	0.000013	9.26943 - 10.64	7.23595 - 12.24	7.41410 - 17.84	7.25385 - 11.44	24
25	2 Ursæ Minoris	15 20	59.53	-0.0005	0.1589	0.0380	0.000007	9.14799 - 7.94	7.22800 - 8.84	7.20116 - 212.24	7.12705 - 8.74	25
26	2 Ursæ Minoris	15 49	19.94	+0.0127	-2.3340	0.1026	0.000017	9.24681 + 0.54	7.43984 - 15.64	7.36811 - 38.24	7.23759 + 0.04	26
27	Groombridge 2320	16 5	56.53	-0.0098	+0.1356	0.0206	0.000002	8.93283 - 5.94	7.19780 - 4.84	9.13222 + 330.84	8.90058 - 6.64	27
28	15 Draconis	16 28	17.14	+0.0008	-0.1498	0.0207	-0.000002	8.86178 - 3.24	7.23545 - 4.54	7.17549 - 121.24	7.83217 - 3.94	28
29	2 Ursæ Minoris	17 0	59.04	+0.0149	6.4519	0.1593	+0.000060	9.10110 + 68.44	7.08053 - 13.54	7.80969 - 20.64	7.09713 + 68.24	29
30	2 Draconis	17 37	48.25	+0.0059	0.3634	0.0609	0.000000	8.25154 + 10.84	7.26408 - 1.24	7.56037 - 16.64	7.22118 + 10.64	30
31	2 Ursæ (pr.)	17 44	31.56	+0.0021	1.0878	+0.0077	0.000002	8.16823 + 49.54	7.33808 - 1.24	7.03656 - 6.24	7.14697 + 49.54	31
32	2 Ursæ Minoris	18 19	6.89	+0.0285	19.3527	-0.2762	0.001561	8.97152 - 796.74	7.04925 + 10.14	7.128675 + 11.44	8.97076 - 796.74	32
33	50 Draconis	18 51	1.51	-0.0040	-1.8846	0.0273	+0.000003	8.76228 - 22.94	7.40746 + 4.94	7.27521 + 12.54	8.74774 - 22.74	33
34	2 Ursæ Minoris	19 12	30.57	+0.0192	+0.0182	0.0113	-0.000001	8.73231 + 3.24	7.21725 + 3.14	8.26102 - 569.04	8.69763 + 3.24	34
35	2 Ursæ Minoris	19 18	18.77	-0.0264	-1.0704	0.0281	0.000001	8.88524 - 4.94	7.33420 + 5.84	7.02954 + 22.74	8.56603 - 4.44	35
36	2 Ursæ Minoris	19 48	38.47	+0.0144	0.1786	0.0218	0.000002	8.94717 + 4.24	7.23700 + 5.64	7.25188 + 105.74	8.91987 + 4.94	36
37	2 Ursæ Minoris	20 8	30.56	-0.0707	54.6200	14.7778	0.007653	0.25692 - 183.44	7.45897 + 218.44	7.173736 + 230.34	0.25684 - 183.44	37
38	2 Ursæ Minoris	20 13	41.29	+0.0025	1.8691	0.0517	0.000014	9.22187 + 1.24	7.40237 + 14.24	7.27164 + 37.84	9.21106 + 1.84	38
39	Groombridge 3241	20 30	35.80	-0.0078	0.1941	0.0332	0.000006	9.12079 + 7.14	7.23346 + 8.44	7.28798 + 145.04	9.09910 + 7.94	39
40	12-Yr. Catal. 1879	20 54	1.03	-0.0115	-2.4316	0.1518	0.000048	9.42235 + 8.44	7.44503 + 24.04	7.38590 + 54.04	9.41571 + 8.74	40
41	2 Ursæ Minoris	21 26	46.31	+0.0018	+0.8040	0.0170	0.000004	9.18299 + 11.14	7.08059 + 5.94	9.90529 - 18.44	9.15571 + 12.84	41
42	11 Cephei	21 39	46.90	+0.0265	0.8859	0.0164	0.000004	9.21660 + 11.84	7.06267 + 5.94	9.94740 - 16.44	9.19133 + 13.04	42
43	79 Draconis	21 51	3.84	-0.0083	0.7370	0.0230	0.000006	9.28567 + 13.24	7.08539 + 8.04	9.86746 - 27.14	9.26630 + 17.54	43
44	226 Cephei	22 29	42.63	-0.0014	1.0902	-0.0164	-0.000006	9.39012 + 16.54	7.00890 + 6.74	0.03748 - 13.04	9.37602 + 17.54	44
45	2 Ursæ Minoris	22 44	31.67	-0.0116	2.1257	+0.0110	+0.000003	9.18117 + 11.14	7.71489 - 10.94	0.32751 + 4.54	9.13999 + 13.84	45
46	2 Ursæ Minoris	23 12	41.37	+0.0138	2.4161	0.0198	0.000005	9.22845 + 11.54	7.54945 - 26.74	0.38312 + 7.24	9.19349 + 13.24	46
47	2 Ursæ Minoris	23 33	25.86	-0.0208	2.4113	0.0265	0.000016	9.46312 + 18.84	7.52925 - 48.04	0.38225 + 13.24	9.45153 + 19.84	47
48	Groombridge 4163	23 47	49.46	+0.0040	+2.8307	+0.0434	+0.000015	9.37264 + 14.84	7.809803 - 157.54	0.45190 + 13.44	9.35461 + 16.04	48

No.	NAME.	δ	μ'	A'	100 B'	100 C'	log a'	log b'	log c'	log d'	No.
1	21 Cassiopea	74 11 39.0	-0.059	+19.807	-0.048	-0.00003	π 8.51783 + 389.5	9.97783 - 0.7	1.29682 - 2.1	π 9.19614 + 75.3	1
2	Polaris	88 32 11.2	+0.006	19.217	0.282	0.00139	π 9.43926 + 206.5	9.98131 - 17.9	1.28370 - 18.3	π 9.45656 + 192.7	2
3	4 Cassiopea	69 30 58.3	-0.079	18.831	0.112	0.00004	π 9.23172 + 82.0	9.94426 - 3.5	1.27488 - 3.9	π 9.53671 + 38.9	3
4	50 Cassiopea	71 42 58.6	-0.000	17.743	0.172	0.00006	π 9.48643 + 49.6	9.92430 - 7.1	1.24904 - 8.5	π 9.66854 + 29.7	4
5	1 Cassiopea	66 44 48.0	-0.019	16.569	0.202	0.00005	π 9.53953 + 39.6	9.88027 - 9.0	1.21930 - 10.6	π 9.75085 + 22.3	5
6	48 Cephei	77 11 40.0	-0.064	14.051	0.381	0.00013	π 9.77788 + 29.0	9.83454 - 23.9	1.14772 - 23.8	π 9.85342 + 22.5	6
7	α Camelopardalis	66 5 21.0	+0.009	6.887	0.406	0.00004	π 9.83423 + 10.2	9.94683 - 50.7	0.83804 - 51.5	π 9.97275 + 6.8	7
8	Groombridge 966	74 56 14.9	-0.002	+3.451	0.573	-0.00004	π 9.92349 + 5.5	9.22053 - 146.5	0.53796 - 146.9	π 9.99347 + 4.4	8
9	22 Camelopardalis	69 21 44.7	-0.109	-0.250	0.483	+0.00000	π 9.89366 - 0.4	π 8.06762 + 141.67	π 9.39867 + 141.5	π 9.99997 - 0.3	9
10	51 Cephei	87 15 8.3	+0.002	2.713	2.208	0.00062	π 9.98626 - 14.9	π 9.13072 + 654.6	π 0.43347 + 654.4	π 9.99599 - 14.3	10
11	Piazzi VII. 67	68 45 15.1	-0.073	6.509	0.435	0.00004	π 9.85994 - 9.8	π 9.48071 + 57.2	π 0.81353 + 57.5	π 9.97583 - 6.9	11
12	3 Ursæ Majoris	68 53 39.4	-0.011	9.901	0.384	0.00006	π 9.81628 - 15.7	π 9.69326 + 32.9	π 9.99566 + 33.5	π 9.93935 - 11.0	12
13	σ^2 Ursæ Majoris	67 43 5.0	-0.095	14.031	0.279	0.00007	π 9.69606 - 26.9	π 9.81113 + 16.2	π 0.14708 + 17.2	π 9.85404 - 16.8	13
14	1 Draconis	81 57 38.3	+0.005	15.138	0.441	0.00025	π 9.76999 - 40.1	π 9.87353 + 34.8	π 1.18007 + 33.9	π 9.81688 - 33.8	14
15	24 Ursæ Majoris	70 27 48.6	+0.050	15.452	0.251	0.00007	π 9.65864 - 32.0	π 9.86100 + 13.1	π 1.18900 + 14.0	π 9.80447 - 21.0	15
16	32 Ursæ Majoris	65 49 45.0	-0.035	17.686	0.150	0.00004	π 9.40238 - 53.9	π 9.90553 + 5.9	π 1.24762 + 7.4	π 9.67356 - 26.5	16
17	9 Draconis	76 27 26.7	-0.030	18.274	0.157	0.00008	π 9.47575 - 57.0	π 9.94733 + 6.7	π 1.26182 + 7.4	π 9.61503 - 37.5	17
18	λ Draconis	70 7 50.2	-0.059	19.792	-0.039	0.00003	π 7.67389 - 115.5	π 9.96795 + 0.4	π 1.12964 + 1.7	π 9.20909 - 37.0	18
19	4 Draconis	78 25 18.8	-0.008	20.050	+0.009	0.00001	9.04128 + 96.7	π 9.99095 - 1.1	π 1.30213 - 0.5	8.36840 + 77.2	19
20	κ Draconis	70 35 16.1	-0.024	19.914	0.027	0.00001	9.40855 + 36.0	π 9.97150 - 2.5	π 1.29916 - 1.2	9.07448 + 68.6	20
21	32 Camelopardalis (fall.)	84 12 3.7	-0.021	19.616	0.009	0.00001	9.40001 + 10.8	π 9.98813 - 0.7	π 1.29260 - 0.4	9.31893 + 5.1	21
22	α Draconis	65 4 11.0	-0.034	17.349	+0.063	0.00000	9.80476 + 7.3	π 9.89454 - 4.7	π 1.23926 - 3.1	9.70049 + 8.9	22
23	5 Ursæ Minoris	76 20 25.3	-0.020	16.023	-0.007	0.00002	9.83689 + 0.5	π 9.89005 - 0.3	π 1.20475 + 0.4	9.77918 - 0.9	23
24	β Ursæ Minoris	74 44 52.3	-0.029	14.717	0.010	0.00002	9.88626 + 0.2	π 9.85001 - 0.1	π 1.16782 + 0.6	9.83210 - 0.9	24
25	γ^2 Ursæ Minoris	72 21 0.1	+0.028	12.825	0.006	0.00001	9.93662 + 0.1	π 9.78487 - 0.2	π 1.10806 + 0.4	9.88583 - 0.4	25
26	ζ Ursæ Minoris	78 14 18.0	-0.003	10.825	-0.141	0.00005	9.96028 - 3.5	π 9.72297 + 11.6	π 1.03443 + 11.3	9.92522 - 4.7	26
27	Groombridge 2320	68 11 32.5	-0.070	9.574	+0.011	0.00001	9.98990 + 0.3	π 9.64662 - 1.6	π 0.98111 - 1.0	9.94384 - 0.2	27
28	15 Draconis	69 4 54.3	+0.034	7.813	-0.008	0.00001	0.00656 - 0.1	π 9.56098 + 0.4	π 0.89283 + 0.9	9.96426 - 0.2	28
29	ϵ Ursæ Minoris	82 16 6.7	+0.001	5.108	0.454	0.00009	0.00715 - 4.7	π 9.40204 + 76.3	π 0.70825 + 76.3	9.98544 - 5.4	29
30	ω Draconis	68 49 27.0	+0.292	1.939	0.026	0.00000	0.03537 - 0.1	π 8.95506 + 11.7	π 0.28767 + 11.6	9.99796 - 0.1	30
31	ψ^1 Draconis (pr.)	72 13 7.4	-0.261	-1.353	0.079	+0.00000	0.03446 - 0.2	π 8.80791 + 50.3	π 0.13141 + 50.2	9.99901 - 0.2	31
32	δ Ursæ Minoris	86 35 58.0	+0.018	+1.671	1.404	-0.00019	0.00882 + 4.4	8.92000 - 802.2	0.22300 - 802.3	9.99849 + 4.7	32
33	50 Draconis	75 15 37.3	+0.058	4.428	0.135	0.00001	0.02269 + 1.0	9.32943 - 26.2	0.64621 - 26.6	9.98915 + 1.3	33
34	δ Draconis	67 24 23.2	+0.068	6.240	0.000	0.00001	0.01876 - 0.1	9.45827 + 0.7	0.79519 - 0.0	9.97789 + 0.6	34
35	τ Draconis	73 5 5.3	+0.098	6.721	0.075	0.00001	0.01186 + 0.8	9.50597 - 9.1	0.82742 - 9.7	9.97414 + 1.2	35
36	ϵ Draconis	69 53 54.0	-0.004	9.155	0.014	0.00001	9.99329 + 0.0	9.63213 - 6.4	0.96168 - 1.3	9.94926 + 0.3	36
37	λ Ursæ Minoris	88 52 32.2	+0.015	10.666	3.379	0.00889	9.93207 + 104.3	9.72568 - 205.5	1.02801 - 205.7	9.92781 + 106.3	37
38	κ Cephei	77 16 20.7	-0.001	11.047	0.116	0.00004	9.95891 + 2.9	9.73019 - 8.5	1.04324 - 9.2	9.92150 + 3.9	38
39	Groombridge 3241	72 2 24.8	-0.022	12.251	0.014	0.00001	9.94791 - 0.1	9.76423 + 0.0	1.05817 - 1.0	9.98859 + 0.5	39
40	12-Yr. Catal. 1879	80 0 20.9	-0.049	13.807	-0.132	0.00006	9.89742 + 5.5	9.83121 - 7.7	1.14009 - 8.3	9.86053 + 7.3	40
41	β Cephei	69 55 28.5	-0.038	15.738	+0.033	0.00001	9.86402 - 3.5	9.89748 + 3.2	1.19695 + 1.8	9.79230 - 3.2	41
42	11 Cephei	70 38 39.1	+0.072	16.418	0.034	0.00001	9.83613 - 4.3	9.88782 + 3.1	1.21533 + 1.8	9.75916 - 4.0	42
43	79 Draconis	73 1 0.0	-0.009	16.965	0.025	0.00001	9.80405 - 4.5	9.90794 + 2.6	1.22555 + 1.3	9.72703 - 3.7	43
44	226 Cephei	75 28 45.6	-0.010	18.520	0.027	0.00001	9.68159 - 9.1	9.95129 + 2.4	1.26763 + 1.3	9.58416 - 8.2	44
45	ι Cephei	65 26 18.4	-0.141	18.978	0.046	0.00001	9.67624 - 14.5	9.93482 + 4.1	1.27826 + 2.1	9.50973 - 19.7	45
46	σ Cephei	67 19 6.3	-0.019	19.630	0.032	0.00001	9.55199 - 23.3	9.95572 + 3.4	1.29292 + 1.4	9.31168 - 36.6	46
47	ν Cephei	76 49 23.7	+0.148	19.921	0.016	0.00001	9.32540 - 43.0	9.98549 + 1.8	1.29932 + 0.7	9.06321 - 66.0	47
48	Groombridge 4163	73 36 12.3	-0.030	+20.028	+0.007	-0.00001	9.23903 - 59.9	9.98136 + 1.7	1.30164 + 0.2	8.72478 - 171.9	48

The arrangement of these tables scarcely requires comment. The mean place of a circumpolar star is given by the formula :

$$\begin{aligned} a_1 &= a + (\mu + A) t + B t^2 + C t^3 + \&c. \\ \delta_1 &= \delta + (\mu' + A') t + B' t^2 + C' t^3 + \&c. \end{aligned}$$

where t denotes the number of years since 1855.0, or, with a negative sign, the number of years previous to that epoch.

For the following stars, the terms containing the fourth or higher powers of the time become appreciable within a century:

<i>Polaris.</i>	<i>51 Cephei.</i>	<i>λ Ursæ Minoris.</i>	<i>δ Ursæ Minoris.</i>
A ^s +18.0464	A ^s +30.6746	A ^s -54.6200	A ^s -19.3527
B + 0.0603 21	B - 0.0079 17	B - 0.1477 78	B - 0.0027 62
C + 0.0002 1167	C - 0.0000 4121	C - 0.0000 7653	C + 0.0000 1561
D + 0.0000 0071 28	D + 0.0000 0003 49	D + 0.0000 0144 51	D + 0.0000 0000 64
E + 0.0000 0000 2288	E + 0.0000 0000 0097	E + 0.0000 0000 7277	E - 0.0000 0000 0019
F + 0.0000 0000 0006 97	F - 0.0000 0000 0000 14	F + 0.0000 0000 0007 11	F - 0.0000 0000 0000 01
G + 0.0000 0000 0000 0193		G - 0.0000 0000 0000 1158	
H + 0.0000 0000 0000 0000 40		H - 0.0000 0000 0000 0002 12	
A' +19.217	A' -2.7131	A' +10.666	A' +1.671
B' - 0.0038 2	B' -0.0220 8	B' - 0.0337 9	B' -0.0140 4
C' - 0.0000 139	C' +0.0000 062	C' - 0.0000 889	C' -0.0000 019
D' - 0.0000 0004 9	D' +0.0000 0002 3	D' - 0.0000 0009 2	D' +0.0000 0000 8
E' - 0.0000 0000 018	E' -0.0000 0000 002	E' + 0.0000 0000 052	
F' - 0.0000 0000 0000 6		F' + 0.0000 0000 0002 5	
G' - 0.0000 0000 0000 001		G' - 0.0000 0000 0000 005	
H' - 0.0000 0000 0000 0000 1			
<i>32 Camelopardalis.</i>	<i>ϵ Ursæ Minoris.</i>	<i>21 Cassiopeæ.</i>	<i>1 Draconis.</i>
A ^s +0.3279	A ^s -6.4519	A ^s +3.8138	A ^s +9.2816
B +0.0011 71	B +0.0015 03	B +0.0007 91	B -0.0040 61
C -0.0000 0109	C +0.0000 0060	C +0.0000 0026	C +0.0000 0135
D +0.0000 0000 10	D -0.0000 0000 04	D +0.0000 0000 01	D +0.0000 0000 02
E -0.0000 0000 0001			
<i>9 Draconis.</i>	<i>4 Draconis.</i>	<i>12-Y. C. 1879.</i>	<i>48 Cephei.</i>
A ^s +5.3597	A ^s +2.9194	A ^s -2.4316	A ^s +7.2695
B -0.0014 26	B -0.0006 45	B -0.0015 18	B +0.0017 51
C +0.0000 0046	C +0.0000 0032	C -0.0000 0048	C +0.0000 0021
D -0.0000 0000 01	D -0.0000 0000 01	D -0.0000 0000 01	D -0.0000 0000 02

The constant logarithms for reduction from the mean to the apparent equinox are given for the epoch 1855.0, with their annual variations.

In the Time-Star List the annual precessions and secular variations are given in the ordinary manner.

No.	NAME.	Mag.	α		μ	Prec.	Sec. var.	$\log a$	$\log b$	$\log c$	$\log d$	δ	No.
			<i>h.</i>	<i>m.</i>	<i>s.</i>	<i>s.</i>	<i>s.</i>					$^{\circ}$ $'$	
1	α Andromedæ . . .	2	0	0	54.00	+0.0102	+3.075	+0.018	8.8791 + 0.22	6.4729 + 197.22	0.4878 + 0.22	8.5549 + 1.02	1
2	γ Pegasi . . .	2 $\frac{3}{4}$	5	46.39	0.0006	3.080	0.010	8.8376 + 0.1	7.2389 + 37.1	0.4886 + 0.1	8.2326 + 1.7	+14 22.6	2
3	α Cassiopeiæ . . .	2	32	18.29	0.0076	3.348	+0.055	9.0691 + 0.5	8.2211 + 8.0	0.5247 + 0.7	8.9864 + 0.7	+55 44.5	3
4	β Ceti . . .	2	36	18.53	+0.0143	3.000	-0.006	8.8422 - 0.3	8.0457 + 5.8	0.4771 - 0.1	7.9070 + 3.1	-18 47.0	4
5	ϵ Piscium . . .	4	55	25.30	-0.0035	3.112	+0.009	8.8144 - 0.2	8.2065 + 4.0	0.4930 + 0.1	7.9070 + 3.1	+7 6.5	5
6	θ Ceti . . .	3	1	16	46.58	-0.0053	3.003	0.002	8.8044 - 0.4	8.3461 + 2.6	0.4775 - 0.0	7.9955 - 2.9	6
7	η Piscium . . .	3 $\frac{1}{2}$	23	43.75	+0.0009	3.196	0.014	8.8085 - 0.3	8.3912 + 2.7	0.5046 + 0.2	8.2099 + 1.2	+14 35.7	7
8	ϕ Piscium . . .	4	37	44.50	0.0061	3.154	0.011	8.7879 - 0.4	8.4453 + 2.2	0.4988 + 0.2	7.9538 + 2.2	+8 25.6	8
9	β Arietis . . .	2 $\frac{3}{4}$	46	38.25	0.0062	3.291	0.018	8.8024 - 0.4	8.5031 + 2.2	0.5174 + 0.2	8.3384 + 0.6	+20 5.8	9
10	α Arietis . . .	2	59	0.46	+0.0142	3.350	0.020	8.7978 - 0.4	8.5549 + 1.8	0.5251 + 0.2	8.3856 + 0.5	+22 46.5	10
11	65 Ceti . . .	4 $\frac{1}{2}$	2	5	19.14	-0.0042	3.172	0.012	8.7599 - 0.6	8.5443 + 1.7	0.5013 + 0.1	7.9122 + 1.9	11
12	γ Ceti . . .	3 $\frac{1}{2}$	35	47.46	0.0094	3.110	0.009	8.7152 - 0.8	8.6227 + 1.2	0.4928 + 0.1	7.3755 + 6.3	+2 37.4	12
13	α Ceti . . .	2 $\frac{1}{2}$	54	42.22	0.0015	3.129	0.010	8.6840 - 0.9	8.6639 + 1.0	0.4954 + 0.1	7.4720 + 3.9	+3 31.2	13
14	ζ Arietis . . .	4 $\frac{3}{4}$	3	6	34.43	-0.0015	3.435	0.018	8.6890 - 1.0	8.7139 + 1.1	0.5360 + 0.2	8.2334 - 0.2	14
15	α Persei . . .	2	13	59.50	+0.0020	4.238	0.048	8.8312 - 1.2	8.8844 + 1.5	0.6271 + 0.5	8.7112 - 1.0	+49 20.5	15
16	δ Persei . . .	4 $\frac{1}{2}$	32	37.04	0.0002	4.232	0.042	8.7706 - 1.5	8.8960 + 1.3	0.6266 + 0.4	8.6370 - 1.3	+47 19.2	16
17	η Tauri . . .	3	38	52.31	0.0010	3.550	0.018	8.6236 - 1.5	8.7739 + 0.9	0.5502 + 0.2	8.2270 - 0.9	+23 39.2	17
18	ζ Persei . . .	3	45	1.56	0.0006	3.752	0.022	8.6376 - 1.6	8.8128 + 0.9	0.5742 + 0.2	8.3550 - 1.2	+31 27.0	18
19	γ Eridani . . .	3	51	15.94	0.0044	2.791	0.005	8.5633 - 1.5	8.7644 + 0.5	0.4458 + 0.0	7.9446 - 2.3	-13 55.4	19
20	γ Tauri . . .	4	4	11	32.74	0.0085	3.397	0.012	8.4983 - 2.0	8.7890 + 0.6	0.5311 + 0.1	7.9189 - 1.3	20
21	ϵ Tauri . . .	3 $\frac{1}{2}$	20	9.24	0.0076	3.486	0.012	8.4732 - 2.3	8.8053 + 0.6	0.5423 + 0.1	7.9826 - 1.8	+18 51.3	21
22	ALDEBARAN . . .	1	27	36.27	+0.0045	3.430	0.011	8.4352 - 2.5	8.8052 + 0.5	0.5352 + 0.1	7.8811 - 2.8	+16 13.0	22
23	γ Aurigæ . . .	3	47	33.39	-0.0008	3.895	0.015	8.3925 - 3.7	8.8779 + 0.5	0.5905 + 0.1	8.1279 - 3.5	+32 56.0	23
24	11 Orionis . . .	5	56	17.21	+0.0025	3.421	0.008	8.2778 - 3.8	8.8224 + 0.3	0.5342 + 0.1	7.6964 - 3.4	+15 11.9	24
25	CAPELLA . . .	1	5	5	59.02	+0.0086	4.411	0.018	8.3492 - 5.8	8.9687 + 0.4	0.6445 + 0.2	8.2050 - 5.7	25
26	RIHEL . . .	1	7	34.25	-0.0001	2.880	0.004	8.1842 - 3.9	8.8171 + 0.2	0.4594 + 0.0	7.3474 - 4.6	-8 22.4	26
27	β Tauri . . .	2	17	7.71	+0.0017	3.785	0.008	8.1494 - 6.3	8.8723 + 0.3	0.5780 + 0.1	7.8278 - 6.2	+28 28.8	27
28	δ Orionis . . .	2	24	36.02	0.0009	3.062	0.004	8.0110 - 6.2	8.8187 + 0.1	0.4861 + 0.0	7.8567 - 14.6	-0 24.6	28
29	α Leporis . . .	3	26	20.19	+0.0020	2.644	0.003	8.0109 - 5.7	8.8408 + 0.1	0.4222 + 0.0	7.4993 - 5.9	-17 55.8	29
30	ϵ Orionis . . .	2	28	51.43	-0.0005	3.042	0.004	7.9559 - 7.1	8.8200 + 0.1	0.4831 + 0.0	7.6311 - 9.5	-1 17.9	30
31	α Columbae . . .	2	34	24.02	+0.0026	2.170	0.003	7.9533 - 6.2	8.9034 + 0.0	0.3366 + 0.0	7.7025 - 6.2	-34 9.3	31
32	α Orionis . . .	1	47	19.37	0.0017	3.245	+0.003	7.5702 - 19.0	8.8268 + 0.1	0.5112 + 0.0	6.6786 - 18.8	+7 22.5	32
33	μ Geminorum . . .	3	6	14	11.27	0.0059	-0.000	7.6500 + 13.1	8.8577 - 0.1	0.5595 - 0.0	7.2344 + 18.0	+22 35.0	33
34	γ Geminorum . . .	2 $\frac{1}{2}$	29	20.08	0.0040	3.465	-0.001	7.9482 + 8.4	8.8386 - 0.2	0.5397 - 0.0	7.4020 + 8.2	+16 31.2	34
36	ϵ Canis Majoris . . .	1 $\frac{3}{4}$	52	55.71	0.0013	2.357	+0.001	7.82408 + 3.2	8.8695 - 0.1	0.3724 - 0.0	7.9233 + 3.4	-28 46.6	36
37	δ Canis Majoris . . .	2	7	2	29.80	+0.0003	2.439	+0.001	7.83011 + 2.8	8.8545 - 0.2	0.3872 - 0.0	7.9456 + 3.0	37
38	β Geminorum . . .	3 $\frac{1}{2}$	11	27.61	-0.0004	3.592	-0.007	7.83443 + 3.4	8.8360 - 0.4	0.5554 - 0.1	7.9225 + 3.1	+22 14.7	38
41	β Geminorum . . .	1 $\frac{1}{2}$	36	26.26	0.0471	3.731	0.013	7.84907 + 2.5	8.8398 - 0.6	0.5718 - 0.2	8.1675 + 2.2	+28 22.3	41
42	ϕ Geminorum . . .	5	44	37.07	0.0004	3.687	-0.013	7.85188 + 2.3	8.8276 - 0.7	0.5667 - 0.2	7.81779 + 1.9	+27 8.2	42
43	15 Argus . . .	3	8	1	22.20	0.0046	2.561	+0.001	7.85662 + 1.5	8.7988 - 0.4	0.4084 - 0.0	8.1736 + 2.0	43
44	ϵ Hydrae . . .	3 $\frac{1}{2}$	39	5.69	0.0117	3.197	-0.007	7.86331 + 1.2	8.7128 - 0.9	0.5048 - 0.1	7.7158 - 1.1	+6 56.9	44
45	γ Ursæ Majoris . . .	3	49	15.55	0.0453	4.194	0.045	7.88317 + 1.1	8.8725 - 1.5	0.6226 - 0.5	7.7069 + 0.9	+48 36.5	45
46	α Cancri . . .	5 $\frac{3}{4}$	59	53.39	-0.0030	3.260	-0.009	7.86816 + 1.0	8.6820 - 1.1	0.5132 - 0.2	7.9718 - 0.5	+11 15.0	46

TIME-STAR LIST—Continued.

No.	NAME.	Mag.	α	μ	Prece.	Sec. var.	$\log a$	$\log b$	$\log c$	$\log d$	δ	No.
47	α Hydre	2	$h. m. s.$ 9 20 27.71	$s.$ -0.0011	$s.$ +2.951	$s.$ -0.001	$m. s. s.$ 8.7132 + 0.88	8.6352 - 1.14	0.4700 - 0.04	7.8584 + 3.24	$^{\circ}$ - 8	47
48	θ Urse Majoris	3	23 7.99	0.1064	4.167	0.056	8.9270 + 0.6	8.8387 - 2.0	0.6198 - 0.6	7.8255 + 0.4	+52 20.1	48
49	ϵ Leonis	3	37 36.80	0.0028	3.426	0.018	8.7748 + 0.6	8.6297 - 1.7	0.5347 - 0.2	7.83916 + 0.2	+24 26.4	49
50	μ Leonis	4	44 30.50	0.0188	3.446	0.020	8.7921 + 0.5	8.6190 - 1.8	0.5374 - 0.3	7.84444 - 0.2	+26 41.3	50
51	REGULUS	1	10 0 38.77	-0.0165	3.221	0.010	8.7729 + 0.5	8.5315 - 1.8	0.5080 - 0.2	7.81141 - 1.1	+12 40.4	51
52	γ Leonis	2	11 58.34	+0.0203	3.300	0.015	8.8024 + 0.4	8.5097 - 2.2	0.5185 - 0.2	7.83482 - 0.6	+20 34.4	52
53	ρ Leonis	$3\frac{3}{4}$	25 10.42	+0.0005	3.167	0.008	8.7923 + 0.4	8.4349 - 2.3	0.5007 - 0.1	7.80342 - 1.8	+10 3.3	53
54	ζ Leonis	$5\frac{1}{4}$	41 37.89	-0.0006	3.162	0.008	8.8065 + 0.3	8.3579 - 2.9	0.4999 - 0.2	7.80991 - 1.7	+11 18.7	54
55	α Urse Majoris	2	54 44.50	-0.0195	3.794	0.083	8.91421 - 0.4	8.6085 - 4.9	0.5791 - 1.0	7.90902 - 0.7	+62 31.9	55
56	δ Leonis	$2\frac{1}{2}$	11 6 23.50	+0.0117	3.193	-0.013	8.8427 + 0.1	8.2198 - 4.4	0.5042 - 0.2	7.84032 - 0.9	+21 18.9	56
57	δ Crateris	$3\frac{1}{4}$	12 5.65	-0.0078	3.003	+0.006	8.8274 + 0.3	8.1540 - 4.4	0.4775 + 0.1	8.2110 + 1.9	-13 59.8	57
58	τ Leonis	$5\frac{1}{4}$	20 28.79	+0.0019	3.086	-0.002	8.8183 + 0.2	8.0593 - 5.7	0.4895 - 0.0	7.6220 - 5.7	+3 38.8	58
59	91 Leonis	$4\frac{3}{4}$	29 31.53	+0.0000	3.072	+0.000	8.8201 + 0.1	7.9464 - 7.3	0.4874 - 0.0	5.4299 + 3.276	-0 1.4	59
60	β Leonis	2	41 39.65	-0.0344	3.101	-0.008	8.8384 - 0.0	7.7425 - 12.4	0.4915 - 0.1	7.82620 - 1.6	+15 22.9	60
61	γ Urse Majoris	$2\frac{1}{2}$	46 11.01	+0.0116	3.185	0.044	8.90592 - 0.5	7.8399 - 17.6	0.5031 - 0.6	7.89699 - 0.8	+54 30.1	61
62	ϵ Virginis	4	57 49.36	-0.0130	3.074	-0.003	8.8299 - 0.1	6.8077 - 116.1	0.4877 - 0.1	7.80493 - 2.6	+9 32.3	62
63	γ Virginis	$3\frac{3}{4}$	12 12 29.32	0.0037	3.072	+0.002	8.8233 - 0.1	7.5600 + 17.5	0.4874 + 0.0	7.62113 - 222.5	+0 8.3	63
64	β Corvi	$2\frac{1}{4}$	26 46.64	0.0041	3.137	+0.016	8.8556 + 0.1	7.9252 + 8.6	0.4965 + 0.2	8.4402 + 1.1	-22 35.6	64
65	12 Canum Venatic.	$2\frac{1}{4}$	49 14.32	0.0204	2.840	-0.015	8.9239 - 0.5	7.82628 + 3.7	0.4533 - 0.3	7.87238 - 1.0	+39 6.1	65
66	θ Virginis	$4\frac{1}{4}$	13 2 26.78	0.0024	3.102	+0.008	8.8091 - 0.2	7.82553 + 3.5	0.4916 + 0.1	7.7284 + 4.7	-4 45.8	66
67	SPICA	1	13 17 33.56	0.0024	+3.153	+0.011	8.8058 - 0.3	7.83522 + 2.9	0.4988 + 0.1	8.0624 + 1.9	-10 21.2	67
68	ζ Virginis	$3\frac{1}{4}$	27 18.45	0.0189	3.071	+0.006	8.7916 - 0.4	7.83942 + 2.4	0.4872 + 0.1	7.61998 - 186.5	+0 8.8	68
69	η Urse Majoris	2	41 49.36	0.0102	2.386	-0.011	8.9718 - 0.8	7.86495 + 1.1	0.3777 - 0.2	7.85563 - 1.1	+50 2.3	69
70	η Bootis	$2\frac{3}{4}$	47 46.85	0.0031	2.862	-0.001	8.7987 - 0.6	7.85048 + 1.6	0.4566 - 0.0	7.83141 - 1.7	+19 7.6	70
71	ARCTURUS	1	14 9 2.93	0.0790	2.813	+0.000	8.7779 - 0.7	7.85781 + 1.2	0.4492 - 0.0	7.83107 - 1.8	+19 56.4	71
72	θ Bootis	$3\frac{3}{4}$	20 15.58	0.0266	2.070	-0.003	8.9527 - 0.9	7.87990 + 0.5	0.3160 - 0.1	7.85523 - 1.2	+52 31.3	72
73	ϵ Bootis	$2\frac{1}{4}$	38 39.28	0.0025	2.624	-0.000	8.7631 - 0.9	7.86817 + 0.8	0.4190 - 0.2	7.84302 - 1.5	+27 41.2	73
74	α^2 Libre	$2\frac{1}{4}$	42 51.82	0.0085	3.313	+0.016	8.7195 - 0.8	7.86543 + 1.3	0.5202 + 0.3	8.1447 + 0.4	-15 26.2	74
75	β Bootis	3	56 29.05	0.0038	2.264	-0.000	8.8019 - 1.0	7.87886 + 0.5	0.3548 - 0.0	7.86186 - 1.3	+40 57.9	75
76	β Libre	2	15 9 12.55	0.0067	3.225	+0.012	8.6604 - 1.1	7.86954 + 1.0	0.5085 + 0.1	7.8473 + 0.8	-8 50.7	76
77	μ^1 Bootis	$3\frac{3}{4}$	19 0.81	-0.0102	2.278	0.001	8.7370 - 1.1	7.88094 + 0.4	0.3575 - 0.0	7.85253 - 1.4	+37 53.3	77
78	ϵ Coronæ Borealis	2	28 32.97	+0.0097	2.529	0.002	8.6628 - 1.2	7.87722 + 0.5	0.4030 + 0.0	7.83229 - 1.7	+27 12.3	78
79	α Serpentis	$2\frac{1}{4}$	37 7.69	0.0085	2.941	0.006	8.5933 - 1.3	7.87366 + 0.6	0.4685 + 0.1	7.6720 - 3.4	+6 53.1	79
80	ϵ Serpentis	$3\frac{1}{4}$	43 35.45	+0.0091	2.977	0.007	8.5742 - 1.4	7.87436 + 0.6	0.4737 + 0.1	7.5074 - 4.3	+4 55.0	80
81	ϵ Coronæ Borealis	4	51 35.17	-0.0026	2.487	0.003	8.6007 - 1.4	7.88031 + 0.4	0.3937 + 0.0	7.82621 - 1.8	+27 18.1	81
82	δ Scorpii	$2\frac{1}{4}$	51 45.97	0.0009	3.534	0.016	8.5823 - 1.7	7.87855 + 0.8	0.5483 + 0.2	8.1597 - 1.2	-22 12.3	82
83	δ Ophiuchi	$2\frac{1}{4}$	16 6 45.01	0.0037	3.140	0.008	8.5007 - 1.8	7.87693 + 0.6	0.4969 + 0.1	7.2630 + 1.8	-3 19.0	83
84	τ Herculis	$3\frac{1}{4}$	15 22.96	0.0029	1.800	0.005	8.6316 - 1.4	7.89405 + 0.1	0.2553 + 0.1	7.84933 - 1.5	+46 39.6	84
85	ANTARES	$1\frac{1}{4}$	20 31.40	-0.0001	3.666	0.015	8.4944 - 2.4	7.88284 + 0.6	0.5642 + 0.1	8.1380 - 2.1	-26 6.3	85
86	ζ Ophiuchi	$2\frac{3}{4}$	29 10.70	+0.0012	3.295	0.009	8.4175 - 2.5	7.87959 + 0.5	0.5179 + 0.1	7.6686 - 1.6	-10 16.1	86
87	η Herculis	$3\frac{1}{4}$	37 55.58	+0.0032	2.051	0.004	8.4793 - 1.9	7.89062 + 0.1	0.3119 + 0.0	7.82801 - 2.0	+39 12.0	87
88	α Ophiuchi	3	50 48.39	-0.0219	2.856	0.004	8.3033 - 2.9	7.88099 + 0.3	0.4557 + 0.0	7.5256 - 3.6	+9 36.2	88
89	δ Herculis	$5\frac{1}{4}$	56 15.15	-0.0033	+2.212	+0.003	8.3429 - 2.5	7.88872 + 0.1	0.3447 + 0.0	7.80880 - 2.7	+33 46.9	89

TIME-STAR LIST—Continued.

No.	NAME.	Mag.	α	μ	Prec.	Sec. var.	$\log a$	$\log b$	$\log c$	$\log d$	δ	No.
90	α^1 Herulis	1	$h. m. s.$ 17 8 2.22	$s.$ -0.0008	+2.734	+0.004	m 8.1899 - 3.81	m 8.8268 + 0.21	0.4367 + 0.01	m 7.5902 - 4.11	+14 33.5	90
91	b Ophiuchi	5	17 31.07	-0.0004	3.658	0.007	m 8.1288 - 6.2	m 8.8558 + 0.2	0.5632 + 0.1	7.7388 - 6.0	-24 2.2	91
92	α Ophiuchi	2	28 12.28	-0.0074	2.774	0.003	m 7.9754 - 6.4	m 8.8304 + 0.1	0.4431 + 0.0	m 7.3165 - 6.7	+12 40.3	92
93	μ Herulis	3½	40 47.12	-0.0249	2.369	0.003	m 7.8001 - 8.9	m 8.8757 + 0.0	0.3746 + 0.0	m 7.4690 - 9.0	+27 48.6	93
94	γ^2 Sagittarii	3½	56 29.68	-0.0049	3.857	0.002	m 7.0720 - 87.0	m 8.8882 + 0.0	0.5862 + 0.0	6.7764 - 87.0	-30 25.2	94
95	μ Sagittarii	4	18 5 5.55	-0.0015	3.588	0.001	7.2007 + 48.3	m 8.8539 - 0.0	0.5548 - 0.0	m 6.7569 + 48.3	-21 5.5	95
96	η Serpentis	3	13 48.46	-0.0411	3.140	+0.001	7.6043 + 15.8	m 8.8237 - 0.1	0.4970 - 0.0	m 6.3133 + 15.3	-2 55.9	96
97	1 Aquilæ	4½	27 18.94	-0.0022	3.266	-0.000	7.9037 + 8.5	m 8.8254 - 0.1	0.5141 - 0.0	m 7.0653 + 8.2	-8 20.4	97
98	VEGA	1	32 1.74	+0.0184	2.013	+0.002	8.0752 + 4.6	m 8.9270 - 0.0	0.3038 - 0.0	7.8708 + 4.7	+38 39.0	98
99	β Lyreæ	var.	44 43.60	0.0004	2.214	+0.002	8.1889 + 3.6	m 8.8930 - 0.1	0.3451 - 0.0	7.9273 + 3.7	+33 11.8	99
100	σ Sagittarii	2½	46 16.36	+0.0003	3.724	-0.005	8.1742 + 5.6	m 8.8631 - 0.3	0.5710 - 0.1	m 7.8233 + 5.5	-26 28.3	100
101	ξ Aquilæ	3½	58 44.71	-0.0030	2.758	+0.000	8.2404 + 3.3	m 8.8219 - 0.2	0.4406 - 0.0	7.6133 + 3.8	+13 39.1	101
102	d Sagittarii	5	19 9 8.97	-0.0012	3.517	-0.006	8.3218 + 3.5	m 8.8287 - 0.4	0.5461 - 0.1	m 7.8389 + 3.1	-19 12.4	102
103	δ Aquilæ	3½	18 11.19	+0.0152	3.010	0.002	8.3489 + 2.7	m 8.7987 - 0.3	0.4785 - 0.0	7.0424 + 5.5	+2 49.7	103
104	α Aquilæ	5	29 5.31	-0.0003	3.231	0.004	8.4061 + 2.5	m 8.7938 - 0.4	0.5094 - 0.1	m 7.5129 + 1.2	-7 20.8	104
105	γ Aquilæ	2½	39 21.94	+0.0008	2.852	0.001	8.4543 + 2.0	m 8.7888 - 0.4	0.4552 - 0.0	7.7051 + 3.0	+10 15.8	105
106	ALTAIR	1	43 42.46	0.0362	2.892	0.001	8.4694 + 1.9	m 8.7826 - 0.4	0.4613 - 0.1	7.6385 + 3.2	+8 29.3	106
107	β Aquilæ	3½	48 11.41	0.0015	2.946	0.002	8.4841 + 1.8	m 8.7760 - 0.5	0.4692 - 0.1	7.5068 + 3.5	+6 2.9	107
108	τ Aquilæ	6	57 3.39	0.0037	2.931	0.002	8.5162 + 1.6	m 8.7677 - 0.5	0.4671 - 0.1	7.5941 + 3.3	+6 52.4	108
109	α^2 Capricorni	3½	20 10 0.36	0.0026	3.332	0.008	8.5654 + 1.6	m 8.7612 - 0.7	0.5227 - 0.1	m 7.9172 + 0.6	-12 59.4	109
110	π Capricorni	5	19 1.02	+0.0000	3.443	0.012	8.6033 + 1.5	m 8.7621 - 0.8	0.5370 - 0.2	m 8.1090 + 0.7	-18 40.9	110
111	ϵ Delphini	4	26 17.10	-0.0006	2.867	-0.001	8.6068 + 1.3	m 8.7365 - 0.6	0.4574 - 0.1	7.8801 + 2.6	+10 48.9	111
112	α Cygni	1½	36 29.36	+0.0005	2.043	+0.002	8.7726 + 1.1	m 8.8624 - 0.2	0.3103 - 0.0	8.6203 + 1.3	+44 45.9	112
113	μ Aquarii	4½	44 49.76	0.0010	3.241	-0.008	8.6487 + 1.1	m 8.7063 - 1.0	0.5106 - 0.1	m 7.8674 - 0.6	-9 31.4	113
114	γ Cygni	4½	51 46.11	+0.0006	2.233	+0.004	8.7769 + 1.0	m 8.8081 - 0.4	0.3488 + 0.0	8.5904 + 1.3	+40 36.6	114
116	ζ Cygni	3½	21 6 45.98	-0.0006	2.550	0.004	8.7467 + 0.9	m 8.7211 - 0.7	0.4066 + 0.0	8.4409 + 1.5	+29 38.1	116
117	1 Pegasi	4	15 22.93	+0.0091	2.766	+0.002	8.7255 + 0.9	m 8.6670 - 0.9	0.4418 - 0.0	8.2422 + 1.8	+19 11.2	117
118	β Aquarii	3	23 55.36	0.0020	3.163	-0.007	8.7168 + 0.7	m 8.6255 - 1.2	0.5002 - 0.1	m 7.7507 - 2.3	-6 12.5	118
119	ξ Aquarii	4½	30 1.78	0.0062	3.194	0.008	8.7282 + 0.7	m 8.6131 - 1.4	0.5043 - 0.1	m 7.8980 - 1.5	-8 30.1	119
120	ϵ Pegasi	2½	37 3.86	0.0028	2.945	0.001	8.7390 + 0.7	m 8.5960 - 1.2	0.4691 - 0.0	7.9433 + 2.9	+9 12.8	120
121	μ Capricorni	5	45 23.19	0.0230	3.260	0.011	8.7578 + 0.6	m 8.5811 - 1.6	0.5132 - 0.2	m 8.1484 - 0.8	-14 13.9	121
122	α Aquarii	3	58 20.10	0.0005	3.054	0.004	8.7597 + 0.6	m 8.5284 - 1.7	0.4891 - 0.1	m 7.0115 - 30.7	-1 1.4	122
123	θ Aquarii	4½	9 10.77	0.0070	3.165	0.008	8.7758 + 0.5	m 8.4961 - 2.0	0.5004 - 0.1	m 7.9457 - 2.0	-8 30.2	123
124	π Aquarii	4½	17 52.26	0.0004	3.065	0.003	8.7793 + 0.5	m 8.4584 - 2.0	0.4865 - 0.0	6.8296 + 33.1	+0 38.6	124
125	η Aquarii	3½	27 54.26	0.0044	3.080	-0.003	8.7879 + 0.4	m 8.4163 - 2.3	0.4885 - 0.0	m 6.9660 - 36.1	-0 51.8	125
126	ζ Pegasi	5½	34 13.85	+0.0030	2.985	+0.002	8.7995 + 0.4	m 8.3936 - 2.3	0.4750 - 0.0	8.0424 + 2.7	+10 4.5	126
127	λ Aquarii	4	45 2.82	-0.0029	3.135	-0.006	8.8049 + 0.3	m 8.3354 - 3.0	0.4962 - 0.1	m 7.9669 - 2.5	-8 21.0	127
128	α Piscis Australis	1½	49 37.76	+0.0241	3.309	-0.021	8.8673 + 0.1	m 8.3685 - 3.6	0.5197 - 0.3	m 8.5713 - 0.6	-30 23.6	128
129	α Pegasi	2½	57 32.42	+0.0043	2.979	+0.006	8.8215 + 0.4	m 8.2678 - 3.3	0.4741 + 0.1	7.8179 + 1.9	+14 25.6	129
130	θ Piscium	4½	23 20 36.81	-0.0092	3.050	0.003	8.8195 + 0.2	m 8.0590 - 5.5	0.4842 + 0.0	7.8076 + 4.4	+5 35.0	130
131	ι Piscium	4½	32 29.64	+0.0258	3.058	0.003	8.8223 + 0.2	m 7.9037 - 8.1	0.4855 - 0.0	7.7485 + 5.0	+4 50.4	131
132	ω Piscium	3½	23 51 52.04	+0.0105	3.067	+0.005	8.8261 + 0.1	m 7.3763 - 8.1	0.4867 + 0.0	7.8496 + 4.0	+6 3.7	132

MEAN RIGHT-ASCENSIONS OF CIRCUMPOLAR STARS.

No.	NAME	1851.0	1852.0	1853.0	1854.0	1855.0	1856.0	1857.0	1858.0	1859.0	1860.0	1861.0	1862.0	1863.0
1	21 Cassiopeæ . . .	0 35 53.96	35 57.76	36 1 56	36 5.36	36 9.16	36 12.96	36 16.77	36 20.57	36 24.38	36 28.19	36 32.00	36 35.82	36 39.63
2	POLARIS	1 5 18.66	5 36.37	5 54.19	6 12.13	6 30.19	6 48.37	7 6.68	7 25.10	7 43.65	8 2.32	8 21.13	8 40.05	8 59.12
3	A Cassiopeæ . . .	1 20 13.26	20 17.58	20 21.91	20 26.23	20 30.56	20 34.89	20 39.22	20 43.55	20 47.88	20 52.22	20 56.56	21 0.89	21 5.22
4	50 Cassiopeæ . . .	1 50 48.79	50 53.73	50 58.67	51 3.61	51 8.56	51 13.51	51 18.46	51 23.41	51 28.36	51 33.32	51 38.28	51 43.23	51 48.20
5	ε Cassiopeæ . . .	2 16 51.49	16 56.31	17 1.12	17 5.93	17 10.75	17 15.57	17 20.39	17 25.21	17 30.03	17 34.86	17 39.68	17 44.51	17 49.34
6	48 Cephei	3 1 36.43	1 43.71	1 50.99	1 58.27	2 5.55	2 12.84	2 20.13	2 27.42	2 34.72	2 42.03	2 49.33	2 56.64	3 3.95
7	α Camelopardalis .	4 39 16.25	39 22.15	39 28.05	39 33.95	39 39.85	39 45.75	39 51.65	39 57.56	40 3.46	40 9.36	40 15.27	40 21.17	40 27.08
8	Groombridge, 966 .	5 19 50.09	19 58.06	20 6.03	20 14.01	20 21.98	20 29.95	20 37.93	20 45.91	20 53.88	21 1.86	21 9.84	21 17.82	21 25.80
9	22 Camelopardalis .	6 2 25.07	2 31.69	2 38.31	2 44.93	2 51.55	2 58.17	3 4.79	3 11.41	3 18.03	3 24.65	3 31.27	3 37.89	3 44.51
10	51 Cephei	6 29 3.34	29 33.96	30 4.57	30 35.16	31 5.74	31 36.30	32 6.84	32 37.37	33 7.88	33 38.38	34 8.86	34 39.32	35 9.76
11	Piazzi VII, 67 . .	7 15 19.72	15 26.05	15 32.38	15 38.71	15 45.04	15 51.37	15 57.69	16 4.02	16 10.34	16 16.67	16 22.99	16 29.31	16 35.63
12	3 Ursæ Majoris . .	7 57 55.04	58 1.13	58 7.23	58 13.32	58 19.41	58 25.50	58 31.59	58 37.67	58 43.76	58 49.85	58 55.93	59 2.01	59 8.09
13	α ² Ursæ Majoris . .	8 57 12.68	57 18.09	57 23.50	57 28.90	57 34.30	57 39.70	57 45.10	57 50.50	57 55.89	58 1.29	58 6.68	58 12.07	58 17.46
14	9 Ursæ Majoris . .	9 15 24.94	15 34.24	15 43.54	15 52.82	16 2.10	16 11.37	16 20.63	16 29.89	16 39.13	16 48.37	16 57.60	17 6.82	17 16.03
15	24 Ursæ Majoris . .	9 21 12.84	21 18.30	21 23.77	21 29.23	21 34.69	21 40.15	21 45.61	21 51.06	22 5.51	22 1.96	22 7.41	22 12.86	22 18.31
16	32 Ursæ Majoris . .	10 7 9.19	7 13.65	7 18.12	7 22.58	7 27.04	7 31.50	7 35.96	7 40.42	7 44.87	7 49.33	7 53.78	7 58.23	8 2.69
17	9 Draconis	10 22 16.95	22 22.32	22 27.69	22 33.05	22 38.41	22 43.77	22 49.12	22 54.48	22 59.83	23 5.17	23 10.52	23 15.86	23 21.19
18	α Draconis	11 22 29.94	22 33.61	22 37.27	22 40.93	22 44.59	22 48.25	22 51.91	22 55.56	22 59.22	23 2.87	23 6.53	23 10.18	23 13.83
19	4 Draconis	12 5 9.31	5 12.25	5 15.18	5 18.11	5 21.04	5 23.97	5 26.90	5 29.82	5 32.75	5 35.67	5 38.59	5 41.51	5 44.43
20	α Draconis	12 27 5.74	27 8.36	27 10.97	27 13.58	27 16.19	27 18.80	27 21.41	27 24.02	27 26.63	27 29.24	27 31.84	27 34.45	27 37.06
21	32 Camelopard. (foli).	12 48 5.78	48 6.08	48 6.39	48 6.71	48 7.02	48 7.34	48 7.66	48 7.98	48 8.30	48 8.63	48 8.95	48 9.28	48 9.61
22	α Draconis	14 0 21.44	0 23.06	0 24.69	0 26.31	0 27.93	0 29.55	0 31.17	0 32.80	0 34.42	0 36.04	0 37.66	0 39.29	0 40.91
23	5 Ursæ Minoris . .	14 27 54.11	27 53.87	27 53.64	27 53.40	27 53.17	27 52.94	27 52.71	27 52.48	27 52.25	27 52.03	27 51.80	27 51.58	27 51.35
24	β Ursæ Minoris . .	14 51 11.59	51 11.32	51 11.06	51 10.79	51 10.52	51 10.25	51 9.99	51 9.72	51 9.46	51 9.20	51 8.94	51 8.68	51 8.42
25	γ ² Ursæ Minoris . .	15 21 0.17	21 0.01	20 59.85	20 59.69	20 59.53	20 59.37	20 59.21	20 59.05	20 58.90	20 58.74	20 58.59	20 58.43	20 58.28
26	ζ Ursæ Minoris . .	15 49 29.24	49 26.91	49 24.59	49 22.26	49 19.94	49 17.62	49 15.30	49 12.99	49 10.67	49 8.36	49 6.05	49 3.74	49 1.44
27	Groombridge, 2320 .	16 5 56.03	5 56.15	5 56.28	5 56.40	5 56.53	5 56.66	5 56.78	5 56.91	5 57.04	5 57.16	5 57.29	5 57.42	5 57.55
28	15 Draconis	16 28 17.74	28 17.59	28 17.44	28 17.29	28 17.14	28 16.99	28 16.84	28 16.69	28 16.55	28 16.40	28 16.25	28 16.11	28 15.96
29	ε Ursæ Minoris . .	17 1 24.81	1 18.36	1 11.92	1 5.48	0 59.04	0 52.60	0 46.17	0 39.74	0 33.32	0 26.89	0 20.46	0 14.05	0 7.64
30	ω Draconis	17 37 49.68	37 49.32	37 48.97	37 48.61	37 48.25	37 47.89	37 47.54	37 47.18	37 46.82	37 46.47	37 46.11	37 45.76	37 45.40
31	ψ ¹ Draconis (pr.) . .	17 44 35.90	44 34.82	44 33.73	44 32.65	44 31.56	44 30.47	44 29.39	44 28.30	44 27.22	44 26.13	44 25.05	44 23.96	44 22.88
32	δ Ursæ Minoris . .	18 20 24.14	20 4.84	19 45.53	19 26.21	19 6.89	18 47.56	18 28.23	18 8.89	17 49.55	17 30.20	17 10.85	16 51.49	16 32.13
33	50 Draconis	18 51 9.06	51 7.17	51 5.29	51 3.40	51 1.51	50 59.62	50 57.73	50 55.84	50 53.95	50 52.06	50 50.17	50 48.28	50 46.38
34	δ Draconis	19 12 30.42	12 30.46	12 30.49	12 30.53	12 30.57	12 30.61	12 30.64	12 30.68	12 30.72	12 30.75	12 30.79	12 30.83	12 30.86
35	τ Draconis	19 18 23.15	18 22.06	18 20.96	18 19.87	18 18.77	18 17.67	18 16.58	18 15.48	18 14.38	18 13.28	18 12.19	18 11.08	18 9.98
36	ε Draconis	19 48 39.12	48 38.96	48 38.80	48 38.63	48 38.47	48 38.31	48 38.14	48 37.98	48 37.81	48 37.64	48 37.48	48 37.31	48 37.14
37	λ Ursæ Minoris . .	20 12 6.96	11 13.30	10 19.35	9 25.10	8 30.56	7 35.72	6 40.59	5 45.16	4 49.43	3 53.40	2 57.08	2 0.46	1 3.54
38	ζ Cephei	20 13 48.74	13 46.88	13 45.02	13 43.16	13 41.29	13 39.42	13 37.55	13 35.68	13 33.81	13 31.94	13 30.06	13 28.18	13 26.30
39	Groombridge, 3241 .	20 30 36.60	30 36.40	30 36.20	30 36.00	30 35.80	30 35.60	30 35.39	30 35.19	30 34.99	30 34.78	30 34.58	30 34.37	30 34.16
40	12-Yr. C. 1879 . .	20 54 10.78	54 8.35	54 5.91	54 3.47	54 1.03	53 58.59	53 56.14	53 53.69	53 51.23	53 48.78	53 46.32	53 43.85	53 41.39
41	β Cephei	21 26 43.08	26 43.89	26 44.70	26 45.50	26 46.31	26 47.12	26 47.93	26 48.73	26 49.53	26 50.33	26 51.14	26 51.94	26 52.75
42	11 Cephei	21 39 43.25	39 44.16	39 45.07	39 45.99	39 46.90	39 47.81	39 48.72	39 49.64	39 50.55	39 51.46	39 52.37	39 53.28	39 54.19
43	79 Draconis	21 51 0.86	51 1.60	51 2.35	51 3.09	51 3.84	51 4.58	51 5.33	51 6.07	51 6.82	51 7.56	51 8.30	51 9.05	51 9.79
44	226 Cephei	22 29 38.27	29 39.36	29 40.45	29 41.54	29 42.63	29 43.72	29 44.81	29 45.89	29 46.98	29 48.07	29 49.16	29 50.24	29 51.33
45	ι Cephei	22 44 23.22	44 25.33	44 27.44	44 29.56	44 31.67	44 33.78	44 35.90	44 38.01	44 40.13	44 42.24	44 44.36	44 46.47	44 48.59
46	ο Cephei	23 12 31.65	12 34.08	12 36.51	12 38.94	12 41.37	12 43.80	12 46.23	12 48.66	12 51.09	12 53.52	12 55.96	12 58.39	13 0.82
47	γ Cephei	23 33 16.30	33 18.69	33 21.08	33 23.47	33 25.86	33 28.25	33 30.64	33 33.03	33 35.43	33 37.82	33 40.22	33 42.61	33 45.01
48	Groombridge, 4163 .	23 47 38.13	47 40.96	47 43.79	47 46.63	47 49.46	47 52.30	47 55.13	47 57.97	48 0.81	48 3.65	48 6.48	48 9.32	48 12.17

MEAN RIGHT-ASCENSIONS OF TIME-STARS—Continued.

No.	NAME.	1851.0	1852.0	1853.0	1854.0	1855.0	1856.0	1857.0	1858.0	1859.0	1860.0	1861.0	1862.0	1863.0
		<i>h.</i> <i>m.</i> <i>s.</i>	<i>m.</i> <i>s.</i>	<i>m.</i> <i>s.</i>	<i>m.</i> <i>s.</i>	<i>m.</i> <i>s.</i>	<i>m.</i> <i>s.</i>	<i>m.</i> <i>s.</i>	<i>m.</i> <i>s.</i>	<i>m.</i> <i>s.</i>	<i>m.</i> <i>s.</i>	<i>m.</i> <i>s.</i>	<i>m.</i> <i>s.</i>	<i>m.</i> <i>s.</i>
49	ϵ Leonis	9 37 23.11	37 26.53	37 29.95	37 33.38	37 36.80	37 40.22	37 43.65	37 47.07	37 50.49	37 53.91	37 57.34	38 0.76	38 4.18
50	μ Leonis	9 44 16.79	44 20.22	44 23.65	44 27.07	44 30.50	44 33.93	44 37.35	44 40.78	44 44.21	44 47.63	44 51.06	44 54.48	44 57.91
51	REGULUS	10 0 25.95	0 29.15	0 32.36	0 35.56	0 38.77	0 41.98	0 45.18	0 48.39	0 51.59	0 54.80	0 58.00	1 1.21	1 4.41
52	γ Leonis	10 11 45.06	11 48.38	11 51.70	11 55.02	11 58.34	12 1.66	12 4.98	12 8.30	12 11.62	12 14.94	12 18.26	12 21.58	12 24.90
53	ρ Leonis	10 24 57.75	25 0.92	25 4.08	25 7.25	25 10.42	25 13.59	25 16.76	25 19.92	25 23.09	25 26.26	25 29.42	25 32.59	25 35.76
54	ι Leonis	10 41 25.24	41 28.41	41 31.57	41 34.73	41 37.89	41 41.05	41 44.21	41 47.37	41 50.53	41 53.70	41 56.86	42 0.02	42 3.18
55	α Ursæ Majoris	10 54 29.40	54 33.17	54 36.95	54 40.73	54 44.50	54 48.27	54 52.05	54 55.82	54 59.59	55 3.36	55 7.13	55 10.90	55 14.67
56	δ Leonis	11 6 10.68	6 13.88	6 17.09	6 20.30	6 23.50	6 26.70	6 29.91	6 33.11	6 36.32	6 39.52	6 42.73	6 45.93	6 49.13
57	π Crateris	11 11 53.67	11 56.67	11 59.66	12 2.65	12 5.65	12 8.65	12 11.64	12 14.63	12 17.63	12 20.63	12 23.62	12 26.62	12 29.61
58	τ Leonis	11 20 16.44	20 19.53	20 22.61	20 25.70	20 28.79	20 31.88	20 34.97	20 38.05	20 41.14	20 44.23	20 47.32	20 50.41	20 53.49
59	91 Leonis	11 29 19.24	29 22.31	29 25.39	29 28.46	29 31.53	29 34.60	29 37.67	29 40.75	29 43.82	29 46.89	29 49.96	29 53.03	29 56.11
60	β Leonis	11 41 27.38	41 30.45	41 33.52	41 36.58	41 39.65	41 42.72	41 45.78	41 48.85	41 51.91	41 54.98	41 58.05	42 1.11	42 4.18
61	γ Ursæ Majoris	11 45 58.22	46 1.42	46 4.62	46 7.81	46 11.01	46 14.21	46 17.40	46 20.60	46 23.79	46 26.99	46 30.18	46 33.37	46 36.57
62	σ Virginis	11 57 37.12	57 40.18	57 43.24	57 46.30	57 49.36	57 52.42	57 55.48	57 58.54	58 1.60	58 4.66	58 7.72	58 10.79	58 13.85
63	η Virginis	12 12 17.05	12 20.12	12 23.18	12 26.25	12 29.32	12 32.39	12 35.46	12 38.52	12 41.59	12 44.66	12 47.73	12 50.80	12 53.87
64	β Corvi	12 26 34.11	26 37.24	26 40.37	26 43.51	26 46.64	26 49.77	26 52.91	26 56.04	26 59.17	27 2.31	27 5.44	27 8.57	27 11.71
65	12 Canum Venatic.	12 49 3.04	49 5.86	49 8.68	49 11.50	49 14.32	49 17.14	49 19.96	49 22.78	49 25.60	49 28.42	49 31.24	49 34.05	49 36.87
66	θ Virginis	13 2 14.38	2 17.48	2 20.58	2 23.68	2 26.78	2 29.88	2 32.98	2 36.08	2 39.18	2 42.28	2 45.38	2 48.48	2 51.58
67	SPICA	13 17 20.96	17 24.11	17 27.26	17 30.41	17 33.56	17 36.71	17 39.86	17 43.01	17 46.16	17 49.31	17 52.46	17 55.62	17 58.77
68	ζ Virginis	13 27 6.24	27 9.29	27 12.35	27 15.40	27 18.45	27 21.50	27 24.55	27 27.61	27 30.66	27 33.71	27 36.76	27 39.82	27 42.87
69	η Ursæ Majoris	13 41 39.86	41 42.23	41 44.61	41 46.98	41 49.36	41 51.74	41 54.11	41 56.49	41 58.86	42 1.24	42 3.61	42 5.99	42 8.36
70	η Bootis	13 47 35.41	47 38.27	47 41.13	47 43.99	47 46.85	47 49.71	47 52.57	47 55.43	47 58.29	48 1.14	48 4.00	48 6.86	48 9.72
71	ARCTURUS	14 8 51.99	8 54.73	8 57.46	9 0.20	9 2.93	9 5.66	9 8.40	9 11.13	9 13.87	9 16.60	9 19.33	9 22.07	9 24.80
72	θ Bootis	14 20 7.41	20 9.45	20 11.49	20 13.54	20 15.58	20 17.62	20 19.67	20 21.71	20 23.75	20 25.80	20 27.84	20 29.88	20 31.93
73	α Bootis	14 38 28.79	38 31.42	38 34.04	38 36.66	38 39.28	38 41.90	38 44.52	38 47.14	38 49.77	38 52.38	38 55.01	38 57.63	39 0.25
74	α^2 Libræ	14 42 38.60	42 41.91	42 45.21	42 48.52	42 51.82	42 55.12	42 58.43	43 1.73	43 5.04	43 8.34	43 11.65	43 14.96	43 18.26
75	β Bootis	14 56 20.01	56 22.27	56 24.53	56 26.79	56 29.05	56 31.31	56 33.57	56 35.83	56 38.09	56 40.35	56 42.61	56 44.87	56 47.13
76	β Libræ	15 8 59.68	9 2.90	9 6.11	9 9.33	9 12.55	9 15.77	9 18.99	9 22.21	9 25.42	9 28.64	9 31.86	9 35.08	9 38.30
77	μ^1 Bootis	15 18 51.74	18 54.01	18 56.27	18 58.54	19 0.81	19 3.08	19 5.35	19 7.61	19 9.88	19 12.15	19 14.42	19 16.69	19 18.95
78	α Coronæ Borealis	15 28 22.81	28 25.35	28 27.89	28 30.43	28 32.97	28 35.51	28 38.05	28 40.59	28 43.13	28 45.66	28 48.20	28 50.74	28 53.28
79	α Serpentis	15 36 55.89	36 58.84	37 1.79	37 4.74	37 7.69	37 10.64	37 13.59	37 16.54	37 19.49	37 22.44	37 25.39	37 28.34	37 31.29
80	ϵ Serpentis	15 43 23.51	43 26.49	43 29.48	43 32.46	43 35.45	43 38.44	43 41.42	43 44.41	43 47.39	43 50.38	43 53.37	43 56.35	43 59.34
81	ϵ Coronæ Borealis	15 51 25.23	51 27.72	51 30.20	51 32.69	51 35.17	51 37.65	51 40.14	51 42.62	51 45.11	51 47.59	51 50.08	51 52.56	51 55.05
82	δ Scorpii	15 51 31.84	51 35.37	51 38.90	51 42.44	51 45.97	51 49.50	51 53.04	51 56.57	52 0.10	52 3.64	52 7.17	52 10.71	52 14.24
83	δ Ophiuchi	16 6 32.46	6 35.60	6 38.73	6 41.87	6 45.01	6 48.14	6 51.28	6 54.42	6 57.55	7 0.69	7 3.83	7 6.96	7 10.10
84	τ Herculis	16 15 15.77	15 17.57	15 19.37	15 21.16	15 22.96	15 24.76	15 26.55	15 28.35	15 30.15	15 31.95	15 33.74	15 35.54	15 37.34
85	ANTARES	16 20 16.74	20 20.40	20 24.07	20 27.73	20 31.40	20 35.07	20 38.73	20 42.40	20 46.06	20 49.73	20 53.40	20 57.06	21 0.73
86	ζ Ophiuchi	16 28 57.52	29 0.81	29 4.11	29 7.40	29 10.70	29 14.00	29 17.29	29 20.59	29 23.89	29 27.18	29 30.48	29 33.78	29 37.07
87	η Herculis	16 37 47.36	37 49.42	37 51.47	37 53.53	37 55.58	37 57.63	37 59.69	38 1.74	38 3.80	38 5.85	38 7.91	38 9.96	38 12.02
88	α Ophiuchi	16 50 37.05	50 39.89	50 42.72	50 45.56	50 48.39	50 51.22	50 54.06	50 56.89	50 59.73	51 2.56	51 5.40	51 8.23	51 11.06
89	d Herculis	16 56 6.31	56 8.52	56 10.73	56 12.94	56 15.15	56 17.36	56 19.57	56 21.78	56 23.99	56 26.19	56 28.40	56 30.61	56 32.82
90	α^1 Herculis	17 7 51.29	7 54.02	7 56.75	7 59.49	8 2.22	8 4.95	8 7.69	8 10.42	8 13.15	8 15.89	8 18.62	8 21.35	8 24.09
91	b Ophiuchi	17 17 16.29	17 20.10	17 23.75	17 27.41	17 31.07	17 34.73	17 38.39	17 42.04	17 45.70	17 49.36	17 53.02	17 56.67	18 0.33
92	α Ophiuchi	17 28 1.15	28 3.94	28 6.72	28 9.50	28 12.28	28 15.06	28 17.84	28 20.62	28 23.41	28 26.19	28 28.97	28 31.75	28 34.53
93	μ Herculis	17 40 37.74	40 40.09	40 42.43	40 44.78	40 47.12	40 49.46	40 51.81	40 54.15	40 56.50	40 58.84	41 1.19	41 3.53	41 5.87

MEAN RIGHT-ASCENSIONS OF TIME-STARS—Continued.

No.	NAME.	1851.0	1852.0	1853.0	1854.0	1855.0	1856.0	1857.0	1858.0	1859.0	1860.0	1861.0	1862.0	1863.0
94	γ^2 Sagittarii	<i>h.</i> <i>m.</i> <i>s.</i> 17 56 14.27	<i>m.</i> <i>s.</i> 56 18.12	<i>m.</i> <i>s.</i> 56 21.98	<i>m.</i> <i>s.</i> 56 25.83	<i>m.</i> <i>s.</i> 56 29.68	<i>m.</i> <i>s.</i> 56 33.53	<i>m.</i> <i>s.</i> 56 37.38	<i>m.</i> <i>s.</i> 56 41.24	<i>m.</i> <i>s.</i> 56 45.09	<i>m.</i> <i>s.</i> 56 48.94	<i>m.</i> <i>s.</i> 56 52.79	<i>m.</i> <i>s.</i> 56 56.64	<i>m.</i> <i>s.</i> 57 0.50
95	μ Sagittarii	18 4 51.20	4 54.79	4 58.38	5 1.96	5 5.55	5 9.14	5 12.72	5 16.31	5 19.90	5 23.48	5 27.07	5 30.66	5 34.24
96	η Serpentis	18 13 36.06	13 39.16	13 42.26	13 45.36	13 48.46	13 51.56	13 54.66	13 57.76	14 0.86	14 3.95	14 7.05	14 10.15	14 13.25
97	ι Aquilæ	18 27 5.88	27 9.15	27 12.41	27 15.68	27 18.94	27 22.20	27 25.47	27 28.73	27 32.00	27 35.26	27 38.53	27 41.79	27 45.05
98	ν VEGA	18 31 53.61	31 55.65	31 57.68	31 59.71	32 1.74	32 3.77	32 5.80	32 7.83	32 9.87	32 11.90	32 13.93	32 15.96	32 17.99
99	β Lyre	18 44 34.74	44 36.96	44 39.17	44 41.39	44 43.60	44 45.81	44 48.03	44 50.24	44 52.46	44 54.67	44 56.89	44 59.10	45 1.32
100	σ Sagittarii	18 46 1.46	46 5.19	46 8.91	46 12.64	46 16.36	46 20.08	46 23.81	46 27.53	46 31.26	46 34.98	46 38.70	46 42.43	46 46.15
101	ζ Aquilæ	18 58 33.69	58 36.45	58 39.20	58 41.95	58 44.71	58 47.47	58 50.22	58 52.97	58 55.73	58 58.49	59 1.24	59 3.99	59 6.75
102	δ Sagittarii	19 8 54.91	8 58.42	9 1.94	9 5.45	9 8.97	9 12.49	9 16.00	9 19.52	9 23.03	9 26.55	9 30.06	9 33.58	9 37.09
103	δ Aquilæ	19 17 59.09	18 2.11	18 5.14	18 8.17	18 11.19	18 14.21	18 17.24	18 20.27	18 23.29	18 26.32	18 29.34	18 32.37	18 35.39
104	κ Aquilæ	19 28 52.39	28 55.62	28 58.85	29 2.08	29 5.31	29 8.54	29 11.77	29 15.00	29 18.23	29 21.46	29 24.69	29 27.92	29 31.15
105	γ Aquilæ	19 39 10.53	39 13.38	39 16.23	39 19.09	39 21.94	39 24.79	39 27.65	39 30.50	39 33.35	39 36.20	39 39.06	39 41.91	39 44.76
106	ALTAIR	19 43 30.75	43 33.68	43 36.60	43 39.53	43 42.46	43 45.39	43 48.32	43 51.24	43 54.17	43 57.10	44 0.03	44 2.96	44 5.89
107	β Aquilæ	19 47 59.62	48 2.57	48 5.51	48 8.46	48 11.41	48 14.36	48 17.31	48 20.25	48 23.20	48 26.15	48 29.09	48 32.04	48 34.99
108	τ Aquilæ	19 56 51.65	56 54.59	56 57.52	57 0.45	57 3.39	57 6.33	57 9.26	57 12.19	57 15.13	57 18.06	57 21.00	57 23.93	57 26.87
109	ω^2 Capricorni	20 9 47.02	9 50.36	9 53.69	9 57.02	10 0.36	10 3.70	10 7.03	10 10.36	10 13.70	10 17.03	10 20.37	10 23.70	10 27.03
110	π Capricorni	20 18 47.25	18 50.69	18 54.13	18 57.58	19 1.02	19 4.46	19 7.91	19 11.35	19 14.79	19 18.23	19 21.68	19 25.12	19 28.56
111	ϵ Delphini	20 26 5.63	26 8.50	26 11.37	26 14.23	26 17.10	26 19.97	26 22.83	26 25.70	26 28.57	26 31.43	26 34.30	26 37.16	26 40.03
112	α Cygni	20 36 21.19	36 23.23	36 25.26	36 27.31	36 29.36	36 31.40	36 33.45	36 35.49	36 37.53	36 39.58	36 41.62	36 43.66	36 45.71
113	μ Aquarii	20 44 36.79	44 40.03	44 43.28	44 46.52	44 49.76	44 53.00	44 56.24	44 59.49	45 2.73	45 5.97	45 9.21	45 12.45	45 15.69
114	ν Cygni	20 51 37.18	51 39.41	51 41.64	51 43.88	51 46.11	51 48.34	51 50.58	51 52.81	51 55.04	51 57.28	51 59.51	52 1.75	52 3.98
116	ζ Cygni	21 6 35.78	6 38.33	6 40.88	6 43.43	6 45.98	6 48.53	6 51.08	6 53.63	6 56.18	6 58.73	7 1.28	7 3.83	7 6.38
117	ι Pegasi	21 15 11.83	15 14.61	15 17.38	15 20.15	15 22.93	15 25.71	15 28.48	15 31.25	15 34.03	15 36.81	15 39.58	15 42.36	15 45.13
118	β Aquarii	21 23 42.70	23 45.86	23 49.03	23 52.20	23 55.36	23 58.52	24 1.69	24 4.86	24 8.02	24 11.18	24 14.35	24 17.51	24 20.68
119	ξ Aquarii	21 29 48.98	29 52.18	29 55.38	29 58.58	30 1.78	30 4.98	30 8.18	30 11.38	30 14.58	30 17.78	30 20.98	30 24.18	30 27.38
120	ϵ Pegasi	21 36 52.07	36 55.02	36 57.96	37 0.91	37 3.86	37 6.81	37 9.76	37 12.70	37 15.65	37 18.60	37 21.54	37 24.50	37 27.44
121	α Capricorni	21 45 10.06	45 13.34	45 16.62	45 19.91	45 23.19	45 26.47	45 29.76	45 33.04	45 36.32	45 39.60	45 42.89	45 46.17	45 49.45
122	α Aquarii	21 58 7.76	58 10.85	58 13.93	58 17.02	58 20.10	58 23.18	58 26.27	58 29.35	58 32.44	58 35.52	58 38.61	58 41.69	58 44.78
123	θ Aquarii	22 8 58.08	9 1.25	9 4.43	9 7.60	9 10.77	9 13.94	9 17.11	9 20.29	9 23.46	9 26.63	9 29.80	9 32.97	9 36.14
124	π Aquarii	22 17 40.00	17 43.06	17 46.13	17 49.20	17 52.26	17 55.32	17 58.39	18 1.46	18 4.52	18 7.59	18 10.65	18 13.72	18 16.78
125	η Aquarii	22 27 41.92	27 45.01	27 48.09	27 51.18	27 54.26	27 57.34	28 0.43	28 3.51	28 6.60	28 9.68	28 12.76	28 15.85	28 18.93
126	ζ Pegasi	22 34 1.90	34 4.89	34 7.87	34 10.86	34 13.85	34 16.84	34 19.83	34 22.81	34 25.80	34 28.79	34 31.78	34 34.77	34 37.75
127	λ Aquarii	22 44 50.29	44 53.42	44 56.56	44 59.69	45 2.82	45 5.95	45 9.08	45 12.22	45 15.35	45 18.48	45 21.61	45 24.74	45 27.88
128	α Piscis Australis	22 49 24.43	49 27.76	49 31.09	49 34.43	49 37.76	49 41.09	49 44.43	49 47.76	49 51.09	49 54.42	49 57.76	50 1.09	50 4.42
129	α Pegasi	22 57 20.49	57 23.47	57 26.45	57 29.44	57 32.42	57 35.40	57 38.39	57 41.37	57 44.35	57 47.34	57 50.32	57 53.30	57 56.29
130	θ Piscium	23 20 24.65	20 27.69	20 30.73	20 33.77	20 36.81	20 39.85	20 42.89	20 45.93	20 48.97	20 52.01	20 55.06	20 58.10	21 1.14
131	ϵ Piscium	23 32 17.30	32 20.39	32 23.47	32 26.56	32 29.64	32 32.72	32 35.81	32 38.89	32 41.98	32 45.06	32 48.14	32 51.23	32 54.31
132	ω Piscium	23 51 39.73	51 42.81	51 45.88	51 48.96	51 52.04	51 55.12	51 58.20	52 1.27	52 4.35	52 7.43	52 10.51	52 13.58	52 16.66

